

REMARKS/ARGUMENTS

The claims are 14-24. Claims 11 and 12 have been canceled in favor of new claims 21-22 to better define the invention. Claim 13 has also been canceled. Claims 14, 16, and 20, which previously depended on claim 11, have been amended to depend on new claim 21 and claims 15, 17, and 18 have been amended to depend on claim 14. Claim 19, which previously depended on claim 11, has been amended to depend on new claim 22. These claims have also been amended to improve their form. New claims 23 and 24 have been added containing subject matter previously appearing in claims 14 and 20, respectively. Reconsideration is expressly requested.

The specification was objected to as lacking headings and the Abstract of the Disclosure was objected to as containing legal phraseology and as not being set forth other than as the front page of the WIPO document. In response, Applicants have amended the Abstract to improve its form and the specification to provide headings as requested. It is respectfully submitted that the foregoing amendments overcome the objections of the Examiner

to the specification and Abstract, and Applicants respectfully request that the objection to the Abstract and specification be withdrawn.

Claim 11 was objected to as reciting "25°C" instead of "250°C" and claims 11-20 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for the reasons set forth on pages 3-6 of the Office Action. In response, Applicants have rewritten claims 11 and 12 as new claims 21-22 including additional recitations to better define the invention, have amended claims 14-20, and have added new claims 23-24 containing subject matter previously appearing in claims 14 and 20, respectively. In addition, claim 13 has been canceled. It is respectfully submitted that all currently pending claims fully comply with 35 U.S.C. 112, second paragraph, and Applicants respectfully request that the rejection on that basis be withdrawn as well.

Claims 11-20 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Myers et al. U.S. Patent No. 2,828,214* in view

of *Prat Urreiztieta* U.S. Patent No. 6,598,654. Essentially the Examiner's position is that *Myers et al.* discloses the method recited in the claims except for specifically disclosing that the additive emits a low gas amount upon heating to high temperature, that *Prat Urreiztieta* discloses this feature, and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify *Myers et al.*'s method by using a molding material that comprises hollow aluminosilicate microspheres that are prepared with low production of gas as taught by *Prat Urreiztieta* in order to manufacture low density cores and molds with good "veining" and penetration characteristics to improve the quality in the manufacture of iron castings via reduction of defects caused by core expansion and gas production at high temperature.

In response, Applicants have canceled claims 11 and 12 in favor of new claims 21-22 to better define the invention and respectfully traverse the Examiner's rejection for the following reasons.

As set forth in new claim 21, Applicants' invention provides a method for producing a core sand or molding sand for casting purposes. In accordance with the method, an additive having an organic component and an inorganic mineral component is provided. The organic component contains over 50 wt.-% carbon and less than 30 wt.-% oxygen, and the additive has a water content of less than 10 wt.-% and emits a gas amount in a temperature range of 250°C to 800°C of less than 500 ml/g. Additive grains of the additive are closely ground or pelletized so that more than 50 wt.-% of the additive grains have a grain size of at least approximately 0.05 mm. Subsequently, a granular mineral molding material with molding material grains having an average grain size less than 0.50 mm is mixed with the additive grains to form an additive mixture including over 90 wt.-% of the molding material and a residual amount comprising the additive and if necessary binding agents.

As set forth in new claim 22, Applicants' invention provides a method for producing a core sand or molding sand for casting purposes that includes the steps of;

(a) impregnating and coating granular mineral molding sand grains having an average grain size of less than 0.50 mm with an additive having an organic component and an inorganic mineral component, the organic component containing over 50 wt.-% carbon and less than 30 wt.-% oxygen, the additive having a water content of less than 10 wt.-% and emitting a gas amount in a temperature range of 250°C to 800°C of less than 500 ml/g, to form aggregate grains of molding material grains impregnated and encased with the additive; and

(b) coarsely grinding and pelletizing the aggregate grains to form a finished mixture wherein more than 50 wt.-% of the additive grains have a grain size of at least approximately 0.05 mm, the finished mixture comprising over 90 wt.-% of the molding material and a residual amount comprising the additive and if necessary binding agents.

With Applicants' invention as recited in new claims 21 and 22, casting defects in the production of foundry work pieces can be advantageously reduced or actually eliminated entirely as a result of the features recited in these claims **in combination**.

First of all, as recited in Applicants' claims, it is necessary for the base material (granular mineral molding material) i.e. its mold base material grains, to be provided with a comparatively small grain size of less than 0.50 mm. This grain size not only guarantees a homogeneous and thorough mixing with the additive to be additionally introduced, but also promotes the formation of aggregate grains as recited in new claim 22 and, if applicable, as an option in new claim 21.

It is of particular significance that the additive used makes use of a special organic compound having a high carbon content and a low oxygen content, and, in addition, contains an inorganic mineral component.

The organic component assures that the metallic mold part can expand without hindrance in the low temperature range that prevails initially during the casting process because the organic component evaporates during this process and thus required "space" for expansion is created. Furthermore, the organic component makes a reducing gas atmosphere available because of

its high carbon content and low oxygen content, which atmosphere delays the decomposition of the binder that is optionally added. As a result, the mold part produced from the core or mold sand retains its shape over a large temperature range. Finally, the high carbon content ensures that carbon is present in the gas phase, and the carbon particles that are released as a result can form anthracite from the gas phase, which places itself between the mold part and the metal casting, and essentially acts as a parting layer here. As a result, it is possible to do without conventional finishing measures.

As the temperature rises within the mold material, the inorganic mineral component gains in significance because the minerals of the additive used at this point increasingly soften, melt or react with the mold base material. As a result, possible pressure stresses in the cast work piece are reduced, which could possibly result in cracks.

In this connection, it is understood that the additive is allowed to have only a low water content of less than 10 wt.-%,

so that the processes described are not disrupted by possible steam that occurs in uncontrolled manner.

Finally, it is also important, within the scope of Applicants' invention as recited in claims 21 and 22, that the additive grains are ground to a coarse grain or pelletized before the mixing process. In fact, the coarse grain achieved in this manner ensures that in comparison with a fine grain, the specific surface of the additive is reduced. As a result, the consumption of optional binder can be reduced. Furthermore, it has been shown that the strength of the mold material produced from the core sand and/or mold sand is particularly great if the work is carried out at the indicated grain size for additive grains. Therefore, a particularly shape-stable configuration of the mold material and therefore of the casting mold is achieved, considered over the temperature.

In short, the core sand and/or mold sand produced according to the method recited in new claims 21 and 22, as well as casting mold or a mold material produced from it, combines the following

advantages:

- I) equilization of temperature-related expansions of the foundry work piece;
- II) time-delayed decomposition of the binder and therefore increased shape stability of the casting mold;
- III) formation of anthracite as a predominant replacement for parting agent;
- IV) reduction of expansion stresses; and
- V) great shape stability of the casting mold over the entire temperature range.

All of these advantages and effects are achieved only if Applicants' method as recited in new claims 21 and 22 is carried

out.

None of the cited references discloses or suggests Applicants' method as recited in new claims 21 and 22 nor provides even the slightest inspiration for the combination of steps and features recited therein. The primary reference to *Myers et al.* is entirely different from Applicants' method. First of all, only Examples I, III and IV in columns 4 and 5 of *Myers et al.* deal with mixtures that make use of a mold base material at more than 90 wt.-% in the mixture. Although it is possible to consider that these examples contain a type of additive but in this case it does **not** have an organic component with the indicated properties and in addition an inorganic component as recited in Applicants' new claims 21 and 22. In fact, Example II of *Myers et al.* which might possibly be relevant in this connection has no relevance if only because here the mold base material does not have the indicated minimum weight proportion.

To the extent that an additive of an organic component

(flax) and an inorganic component (bentonite) is mentioned at all in *Myers et al.*, it should be noted that flax consists of approximately 71% cellulose, which in turn has only a slight carbon weight proportion. In other words, flax as an organic component according to the teachings of *Myers et al.* surely does **not** have more than 50 wt.-% carbon as well as less than 30 wt.-% oxygen.

Furthermore, as discussed in the paragraphs bridging pages 17-18 of Applicants' disclosure, the amount of gas emitted by flax (which can be assumed to be similar to that of wood meal and starch) lies in the range of more than 900 ml/g and in part actually amounts to more than 1000 ml/g. In contrast, Applicants' invention as recited in new claims 21 and 22 makes use of an additive whose amount of gas emitted is **less** than 500 ml/g, as a raw material.

The defects and deficiencies of the primary reference to *Myers et al.* are nowhere remedied by the secondary reference to *Prat Urreiztieta*, which involves a composition for producing

molds that comprise mold sand, a resin, and hollow microspheres made of aluminum silicate. These microspheres are produced from aluminum silicate and consequently not on the basis of an organic component containing more than 50 wt.-% carbon as well as less than 30 wt.-% oxygen and in addition an inorganic mineral component as recited in Applicants' new claims 21 and 22.

Likewise, there is no disclosure or suggestion in *Prat Urreiztieta* as to the water content or the amount of gas emitted, which in Applicants' method as recited in new claims 21 and 22 amounts to less than 10 wt.-% for the additive as a raw material, with the amount of gas emitted in the temperature range of 250°C to 800°C amounting to less than 500 ml/g.

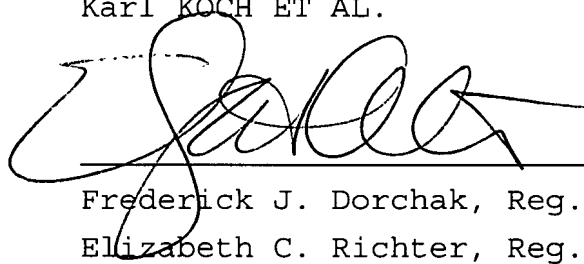
In summary, the teachings of the secondary reference to *Prat Urreiztieta* cannot contribute anything with regard to Applicants' method as recited in new claims 21 and 22 as it obviously remains far behind the primary reference to Myers et al. in terms of disclosure. Accordingly, it is respectfully submitted that new

claims 21 and 22, together with claims 14-20 and 23-24 which depend directly or indirectly thereon, are patentable over the cited references.

In summary, claims 14-20 have been amended, claims 11-13 have been canceled and new claims 21-24 have been added. The specification and Abstract have also been amended. In view of the foregoing, it is respectfully requested that the claims be allowed and that this application be passed to issue.

Applicants also submit herewith the International Preliminary Report on Patentability, the references cited therein having previously been disclosed in Applicants' December 12, 2005 Information Disclosure Statement.

Respectfully submitted,
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I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on May 14, 2007.


Kelly Espitia

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 98 874/M/nu	FOR FURTHER ACTION	See item 4 below
International application No. PCT/EP2004/006306	International filing date (<i>day/month/year</i>) 11 June 2004 (11.06.2004)	Priority date (<i>day/month/year</i>) 12 June 2003 (12.06.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant S & B INDUSTRIAL MINERALS GMBH		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).

2. This REPORT consists of a total of 10 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input checked="" type="checkbox"/> | Box No. II | Priority |
| <input checked="" type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report 01 May 2006 (01.05.2006)
Facsimile No. +41 22 740 14 35	Authorized officer <div style="text-align: center; font-weight: bold; font-size: 1.2em;">Ellen Moyse</div> Telephone No. +41 22 338 89 75

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

Translation

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing
(day/month/year)

Applicant's or agent's file reference

98 874/M/nu

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/EP2004/006306

International filing date (day/month/year)

11.06.2004

Priority date (day/month/year)

12.06.2003

International Patent Classification (IPC) or both national classification and IPC

Applicant

S & B INDUSTRIAL MINERALS GMBH

1. This opinion contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the opinion |
| <input checked="" type="checkbox"/> | Box No. II | Priority |
| <input checked="" type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP

Authorized officer

Facsimile No.

Telephone No.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

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Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. II

Priority

1. ☒ The following document has not yet been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date in the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 4-7

because:

☐ the said international application, or the said claims Nos. _____
relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 4-7
are so unclear that no meaningful opinion could be formed (*specify*):

See supplemental sheet

☐ the claims, or said claims Nos. _____ are so inadequately supported
by the description that no meaningful opinion could be formed.

☐ no international search report has been established for said claims Nos. _____

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.

☐ See Supplemental Box for further details.

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Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	10	YES
	Claims	1-3, 8-9	NO
Inventive step (IS)	Claims		YES
	Claims	1-3, 8-10	NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims		NO
2. Citations and explanations:			
<p>Setting aside the clarity defects (cf. point 3), the following opinion is provided with regard to novelty and inventive step:</p>			
<p>1 The present opinion makes reference to the following documents:</p> <p>D1: US 2 828 214 A (OLSON ERWIN A <i>ET AL.</i>) 25 March 1958 (1958-03-25)</p> <p>D2: DE 196 09 539 A (ASHLAND SUEDCHEMIE KERNFEST) 18 September 1997 (1997-09-18)</p> <p>D3: GB 1 444 280 A (SHELL INT RESEARCH) 28 July 1976 (1976-07-28)</p>			
<p>2 The present application does not meet the requirements of PCT Article 33(1), because the subject matter of independent claim 1 and of dependent claims 2, 3, 8 and 9 is not novel with the meaning of PCT Article 33(2).</p> <p>Document D1 discloses (the references between parentheses relate to said document) compositions for casting cores and moulds, consisting of sand, binders and additives which are mixed (column 1,</p>			

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement

lines 1-24).

The additives contain cellulose, milled flax, which after milling preferably has a particle size of 50-500 µm (column 3, lines 21-34).

Particle size distribution for three examples A, B, C are disclosed in the table in column 4. Example C satisfies the conditions of claims 1 and 2.

Example II in column 5 discloses a quartz sand with organic additive (milled flax) and inorganic additive (bentonite) as well as water, which are mixed for production. In the process, the grains of sand are inevitably sheathed by the additive. Flax also appears to meet the conditions of claims 5 and 7.

Therefore, D1 discloses both the features of claim 1 and the features of dependent claims 2, 3, 8 and 9.

- 3 The present application does not meet the requirements of PCT Article 33(1), because the subject matter of claim 1 does not involve an inventive step within the meaning of PCT Article 33(3).

Document D2 is considered by the applicant to be the closest prior art to the subject matter of claim 1. It discloses all the features of the preamble of claim 1.

No details are provided as to the process of producing the additive or its grain sizes.

According to D3, milled bitumen with grain sizes of

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Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement

from 0.02-1.0 mm is used as organic additive (page 2, lines 60-68). The sand is quartz sand (claim 3). The milling and the resulting grain size for the moulding sand additive is regarded as conventional.

Therefore, a person skilled in the art would combine the features disclosed in D2 and D3 and thereby arrive at the subject matter of claim 1, without thereby being inventive.

Therefore, the subject matter of independent claim 1 cannot be considered inventive (PCT Article 33(3)).

Dependent claims 2, 3, 8-10 do not appear to contain any features which, in combination with the features of any claim to which they refer back, meet the PCT requirements for inventive step.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box III

1 The application does not meet the requirements of PCT Article 6, because claims 1, 4 and 6 are not clear.

1.1 Claim 1 relates to a process for producing a moulding/core sand. The only process features mentioned are:

- moulding base material is mixed with additive grains.
- additive grains are milled or pelletized, or the aggregate grains formed are pelletized or milled.

The numerous "and/or" links means that the continuous production process is not clearly defined, for example because it is not apparent, for example when producing aggregate grains, whether the additive grains are also milled. The order in which the features are carried out is not evident, because the characterizing clause refers simultaneously to obviously preceding features (milling of the additive grains) and subsequent features (pelletizing the aggregate grains).

Therefore, the scope of protection of **claim 1** is not clearly defined.

1.2 Claim 1 relates to a production process. The features of dependent claims 4-7 are regarded as functional features. However, it is not clear from the wording whether the functional properties relate

Supplemental Box

to the additive as raw material or starting material or occur in the moulding sand as the product produced after the process; this applies in particular in the case of agglomerate grain production.

Therefore, **claims 4-7** do not comply with PCT Article 6.

2. There are also objections pursuant to PCT Article 5 relating to the feasibility of execution of the claimed invention within the scope of **claims 4-7**.

The PCT guidelines (PG-II 5.46-48) explain that although a reasonable number of attempts and failed attempts are permissible, a person skilled in the art, based on the disclosure of the application, must be able to carry out the invention over the entire range claimed without "excessive experimentation" and without unacceptably large numbers of attempts. The scope of the claims is of relevance in this context, since a person skilled in the art, based on the content of disclosure of the application, must be able to carry out the invention over the entire claimed range. The possibility of selecting from organic components for the additive having at least one of the properties mentioned in claims 4-7, however, appears almost infinitely wide, and consequently the number of attempts must be considered unacceptable.

Therefore, the objection under PCT Article 5 is justified in this case.